U. S. ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

Date: September 7, 2005
DP Barcode: D315592
PC Code No: 108801

MEMORANDUM

SUBJECT: Data Evaluation Record Review for One Study on Metolachlor

TO: Joanne Miller, Risk Manager
Eugene Wilson, Risk Manager Reviewer
Registration Division (7505C)

FROM: Paige Doelling Brown, Fisheries Biologist Paige Doelling Brown 9/7/05
Kevin Costello, Acting Branch Chief Kevin Costello 9/7/05
Environmental Risk Branch I
Environmental Fate and Effects Division (7507C)

ERB1 has completed the review on one environmental toxicity study for metolachlor. A brief summary is listed below.

MRID 46508901 -Reproductive Effects of Metolachlor on Northern Bobwhite Quail *(Colinus virginianus)*

Study was classified as core.
Most sensitive endpoints: Egg quality (eggs cracked and percentage eggs cracked of eggs laid)
Active Ingredient: LOAEC (egg quality): 1010 ppm a.i.
NOAEC (egg quality): 403 ppm a.i.

Data Evaluation Report on the Reproductive Effects of Metolachlor on Northern Bobwhite Quail, *Colinus virginianus*

PMRA Submission Number EPA MRID Number 465089-01

Data Requirement:	PMRA DATA CODE	
	EPA DP Barcode	D315592
	OECD Data Point	
	EPA MRID	465089-01
	EPA OPP Guideline	§71-4a
	EPA OPPTS Guideline	850.2300

Test material: Metolachlor Technical **Purity:** 97.2%
Common name: Metolachlor
Chemical name: IUPAC: Not reported
CAS name: Not reported
CAS No.: 51218-45-2
Synonyms: None reported

Primary Reviewer: Christie E. Padova **Signature:**
Staff Scientist, Dynamac Corporation **Date:** 7/19/05

QC Reviewer: Teri Myers **Signature:**
Staff Scientist, Dynamac Corporation **Date:** 7/28/05

Primary Reviewer: Paige Doelling-Brown, Biologist **Signature:**
OPP/EFED/ERB - I **Date:** 9/7/05

Secondary Reviewer(s): **Date:**
{EPA/OECD/PMRA}

Reference/Submission No.:

Company Code:
Active Code:
EPA PC Code: 108801

Date Evaluation Completed:

CITATION: Temple, D.L., *et al.* 2005. Metolachlor Technical: A Reproduction Study with the Northern Bobwhite. Unpublished study performed by Wildlife International Ltd., Easton, MD. Laboratory Project No. 568-102. Study sponsored by the Metolachlor Task Force, Chemical Consultants International, Stilwell, KS. Experimental start date March 17, 2004 and experimental termination date September 13, 2004. Final report submitted March 28, 2005.

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EXECUTIVE SUMMARY:

A study assessing the reproductive effects of metolachlor on northern bobwhite quail (*Colinus virginianus*) was conducted. Three treatment groups and a control were assessed, each consisting of 16 pairs (1 male, 1 female). Metolachlor was administered to the birds in the diet at nominal concentrations of 0 (control), 160, 400, and 1000 ppm a.i. (adjusted for purity). Mean-measured concentrations were <50 (<LOD, control), 161, 403, and 1010 ppm a.i., respectively. Based on samples analyzed during the test, metolachlor treated feed was homogeneously mixed and stable under actual use conditions.

No treatment-related effects were observed on adult survival, body weight, or food consumption. Terminal necropsy of birds also showed no treatment related effects. Three (3) birds in the highest treatment group (1010 ppm a.i.) died prior to termination of the test, but deaths did not appear to be treatment related. Food consumption was similar in all groups.

Results were analyzed using EFED's "chicks" program. Statistically significant effects were noted in four of the parameters evaluated: eggshell thickness, day 14 survivor weight, eggs cracked, and percentage eggs not cracked of eggs laid. Statistically significant eggshell thinning occurred at the lowest dose, 161 ppm a.i. (treatment mean 0.22 mm, SD 0.01; control mean 0.23 mm, SD 0.01). However, mean eggshell thickness remained the same (0.22 mm) for all other treatment groups, and no other adverse effects (*e.g.*, cracking, reduced viability) were noted at this dose level. EFED determined eggshell thinning not to be biologically significant. Statistically significant reduction in day 14 survivor weight occurred at 403 ppm a.i. (-2 g, 5% body weight, p=0.05), but this response was not dose dependent. Survivors at the lowest dose (161 ppm a.i.) increased in weight (+0.5g, 2% body weight, p=1.0), and survivors at the highest dose (1010 ppm a.i.) decreased in weight (-1.0 g, 3 % body wieght, p=1.0) less than the medium dose (403 ppm a.i.). This appeared to be more of an artifact of the test than an actual effect.

A statistically significant increase in eggs cracked (p=0.02) occurred at the highest dose, with mean number of eggs cracking increasing with dose. The highest dose (1010 ppm a.i.) is the LOAEC for northern bobwhite quail, and 403 ppm a.i. is the NOAEC.

This study is scientifically sound, and is classified as ACCEPTABLE.

Results Synopsis

Test Organism Size/Age: Approx. 26 weeks old at test initiation (178-244 g)

NOAEC: 403 ppm a.i.
LOAEC: 1010 ppm a.i.
Endpoint(s) Affected: Egg quality (Eggs cracked and percentage of eggs cracked).

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study protocol was based on procedures of the U.S. EPA Ecological Effects Test Guidelines, OPPTS No. 850.2300 (*draft*, 1996). Deviations from U.S. EPA FIFRA Guideline §71-4 are:

1. Mortality of the quail during acclimation was not reported.
2. Although effects on reproduction were observed, a withdrawal period was not incorporated into the test design.
3. The expected field residue level was not reported.
4. The average egg storage temperature (prior to setting for incubation) was 13.0°C, lower than the recommended level of 16°C.

These deviations do not affect the scientific validity of this study.

COMPLIANCE: Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. This study was conducted in accordance with U.S. EPA, OECD, and Japan MAFF GLP standards.

A. MATERIALS:

1. Test Material Metolachlor Technical

Description: Red liquid

Lot No./Batch No.: 0207705

Purity: 97.2%

Stability of Compound Under Test Conditions: The stability of metolachlor in the treated feed was verified at each test concentration level under actual use conditions. Samples of treated feed were collected from the feed troughs on Days 0 and 7 of Week 1. Recoveries were 94-97% of initial values.

Storage conditions of test chemical: Under ambient conditions in locked storage.

OECD requires water solubility, stability in water and light, pK_a, P_{ow}, and vapor pressure of the test compound. OECD requirements were not reported.

2. Test organism:

Table 1: Test organism.

Parameter	Details	Remarks *Criteria*
Species (common and scientific names):	Northern bobwhite quail (*Colinus virginianus*)	*EPA requires: a wild waterfowl species, preferably the mallard, Anas platyrhynchos, or an upland game species, preferably the northern bobwhite, Colinus virginianus.*
Age at Study Initiation:	Approx. 26 weeks	Birds were approaching their first breeding season. *EPA requires: birds should be approaching their first breeding season.*
Body Weight: (mean and range)	Males: Overall range (n=64) 178 to 244 g, with group means of 208 to 213 g. Females: Overall range (n=64) 183 to 238 g, with group means of 201 to 208 g.	Individual body weights were recorded at Weeks 0, 2, 4, 6, 8 and 20 (test termination). *EPA requires that body weights should be recorded at test initiation and at biweekly intervals up to week eight or up to the onset of egg laying and at termination.*
Source:	K & L Quail Oroville, CA	Birds were from the same hatch, and were phenotypically indistinguishable from wild birds. *EPA requires that all birds should be from the same source.*

B. STUDY DESIGN:

1. Experimental Conditions

a. Range-finding Study - None reported. The test concentrations were selected in consultation with the Sponsor, based upon toxicity information provided by the Sponsor.

b. Definitive Study

Table 2: Experimental Parameters.

Parameter	Details	Remarks
		Criteria
Acclimation period:	9 weeks	The study author reported that at test initiation, all birds were examined for physical injuries and general health, and birds that did not appear healthy or were outside the desired weight range were excluded from the study. Quail were fed a basal game-bird diet formulated by Agway Inc., to meet laboratory specifications, and provided public tap water from the city of Easton.
Conditions (same as test or not):	Same as test	
Feeding:	Water and feed were provided *ad libitum.*	
Health (any mortality observed):	Pre-test mortality was not reported.	
		EPA recommends a 2-3 week health observation period prior to selection of birds for treatment. Birds must be generally healthy without excess mortality. Feeding should be ad libitum, and sickness, injuries or mortality be noted.

Parameter	Details	Remarks *Criteria*
Test duration pre-laying exposure: egg-laying exposure: withdrawal period, if used:	 Approximately 10 weeks Approximately 10 weeks None	Although effects on reproduction were observed, a withdrawal period was not incorporated into the test design. *EPA requires* ***Pre-laying exposure duration*** *At least 10 weeks prior to the onset of egg-laying.* ***Exposure duration with egg-laying*** *At least 10 weeks.* ***Withdrawal period*** *If reduced reproduction is evident, a withdrawal period of up to 3 weeks should be added to the test phase.*
Pen (for parental and offspring) size: construction materials: number:	Parents (one pair) were housed in battery breeding cages measuring 27 x 51 x 20/25 cm (sloping floors). Offspring (by set and group) were housed in 72 x 90 x 23 cm battery brooders. Parental and offspring pens were constructed of galvanized wire mesh and galvanized sheeting. 16 parental pens/treatment level	 *Pens* *Adequate room and arranged to prevent cross contamination* *Materials* *Nontoxic material and nonbinding material, such as galvanized steel.* *Number* *At least 5 replicate pens are required for mallards housed in groups of 7. For other arrangements, at least 12 pens are required, but considerably more may be needed if birds are kept in pairs. Chicks are to be housed according to parental grouping.*
Number of birds per pen (male:female)	2 birds/pen (1 male:1 female)	 *EPA requires one male and 1 female per pen. For quail, 1 male and 2 females is acceptable. For ducks, 2 males and 5 females is acceptable.*

Parameter	Details	Remarks *Criteria*
Number of pens per group/treatment negative control: solvent control: treated:	N/A 16 pens 16 pens/treatment	*EPA requires at least 12 pens, but considerably more if birds are kept in pairs. At least 16 is strongly recommended.*
Test concentrations (ppm diet) nominal: measured:	0 (control), 160, 400, and 1000 ppm a.i. <50 (<LOD, control), 161, 403, and 1010 ppm a.i.	Concentrations of the test substance in the diet were adjusted for purity. Samples used for concentration verification analyses were collected from diets during Weeks 1, 4, 8, 12, 16, and 20. Samples were analyzed by GC equipped with an electron capture detector (ECD). *EPA requires at least two concentrations other than the control are required; three or more are recommended.*
Maximum labeled field residue anticipated and source of information:	Not specified	*EPA requires that the highest test concentrations should show a significant effect or be at or above the actual or expected field residue level. The source [i.e., maximum label rate (in lb ai/A & ppm), label registration no., label date, and site should be cited]*

Parameter	Details	Remarks *Criteria*
Solvent/vehicle, if used type: amount:	Acetone and corn oil Approx. 0.2% and 0.3% (v:w), respectively	Percent of solvent/vehicle in final diets was reviewer calculated: 17.4 mL acetone *(in each 1000 g of premix)* ÷ 9000 g *(total weight of final diets)* x 100, and 22.6 mL corn oil *(in each 1000 g of premix)* ÷ 9000 g *(total weight of final diets)* x 100. These calculations are an estimation, as they do not take into consideration the mass of the corn oil added to the basal diet. *EPA requires corn oil or other appropriate vehicle not more than 2% of diet by weight*
Was detailed description and nutrient analysis of the basal diet provided? (Yes/No)	Yes	Basal diets contained ≥27% protein, ≥2.5% fat, ≤5% fiber, and 3% calcium. *EPA requires a commercial breeder feed (or its equivalent) that is appropriate for the test species.*

Parameter	Details	Remarks *Criteria*
Preparation of test diet	The appropriate amount of test substance was dissolved in acetone using a magnetic stir-bar for at least 1 minute. Corn oil was then added to the mixture and stirred for an additional 30 seconds. The test substance mixture was then combined with the entire portion of pre-mix basal ration and mixed for approx. 20 minutes on a Hobart mixer. Separate pre-mixes were prepared for each concentration level approximately every 4 weeks, and were stored frozen until needed. Final diets were prepared weekly. Portions of pre-mix were combined with additional basal ration and limestone.	*A premixed containing the test substance should be mechanically mixed with basal diet. If an evaporative vehicle is used, it must be completely evaporated prior to feeding.*
Indicate whether stability and homogeneity of test material in diet determined (Yes/No)	Yes	
Were concentrations in diet verified by chemical analysis?	Yes	Samples were analyzed from feed prepared during Weeks 2, 3, 4, 8, 12, 16, and 20. Mean-measured concentrations were 101% of nominal concentrations.

Parameter	Details	Remarks *Criteria*
Did chemical analysis confirm that diet was stable?	Yes	The stability of metolachlor in the treated feed was assessed at each test concentration level under actual use conditions. Samples of treated feed were collected from the feed troughs on Days 0 and 7 of Week 1. Recoveries were 94-97% of initial values.
and homogeneous?	Yes	The homogeneity of metolachlor was assessed in the treated feed prepared at all concentration levels; one sample per side was collected from the top, middle, and bottom of each batch. Coefficients of Variation (Cvs) among the six locations were 1.92, 2.40, and 2.79 for the 160, 400, and 1000 ppm a.i. levels, respectively.
Feeding and husbandry	Feeding and husbandry conditions appeared to be adequate, given guideline recommendations.	
Test conditions (pre-laying) temperature: relative humidity: photo-period:	 24.1 ± 0.7°C 54.9 ± 15.7% 8 hr light/day up through Week 7; 17 hr light/day thereafter.	Light intensity averaged 446 lux (approx. 41 foot-candles). Illumination was provided by fluorescent lights which closely approximated noon-day sunlight. *EPA Requires* *Temperature:* *About 21 °C (70 °F)* *Relative humidity:* *About 55%* *Lighting* *First 8 weeks: 7 h per day.* *Thereafter: 16-17 h per day.* *At least 6 foot candles at bird level.*

Parameter	Details	Remarks *Criteria*
Egg Collection and Incubation		
Egg collection and storage collection interval: storage temperature: storage humidity:	Daily 13.0 ± 0.0°C 82 ± 6%	To reduce the possibility of pathogen contamination, the collected eggs were fumigated for 2 hours with formaldehyde gas prior to incubation. *EPA requires eggs to be collected daily; egg storage temperature approximately 16°C (61°F); humidity approximately 65%.*
Were eggs candled for cracks prior to setting for incubation?	Yes	*EPA requires eggs to be candled on day 0*
Were eggs set weekly?	Yes	
Incubation conditions temperature: humidity:	 37.4 ± 0.0°C 54.0 ± 0.0%	
When candling was done for fertility?	Days 11-12 for embryo viability and Day 21 for embryo survival.	*EPA requires:* *Quail: approx. day 11* *Ducks: approx. day 14*
When were the eggs were transferred to the hatcher?	Day 21	*EPA requires:* *Bobwhite: day 21* *Mallard: day 23*
Hatching conditions temperature: humidity: photo-period:	 37.2 ± 0.0°C Approx. 77% 16 hours light/day (hatchlings)	Following removal from the hatcher, all chicks were housed in brooding pens maintained at approx. 38°C, with an average room temperature of 25.1 ± 0.9°C, and an average relative humidity of 65 ± 7%. *EPA requires:* *temperature of 39°C (102°F)* *humidity of 70%*

Parameter	Details	Remarks *Criteria*
Day the hatched eggs were removed and counted	Day 25 or 26	*EPA requires Bobwhite: day 24 Mallard: day 27*
Were egg shells washed and dried for at least 48 hrs before measuring?	Yes, shells were washed and air-dried for at least 1 week.	
Egg shell thickness no. of eggs used:	One egg was collected (when available) from each odd numbered cage during odd numbered weeks and from each even numbered cage during the even numbered weeks.	
intervals:	Once weekly throughout the egg laying period.	*EPA requires newly hatched eggs be collected at least once every two weeks. Thickness of the shell plus membrane should be measured to the nearest 0.01 mm; 3 - 4 measurements per shell.*
mode of measurement:	Five points around the equatorial circumference were measured to the nearest 0.002 mm.	
Reference chemical, if used	None used	

2. Observations:

Table 3: Observations.

Parameter	Details	Remarks/Criteria
Parameters measured		
Parental: (mortality, body weight, mean feed consumption)	- mortality - body weight - food consumption - signs of toxicity - necropsy	
Egg collection and subsequent development: (no. of eggs laid, no. of eggs cracked, shell thickness, no. of eggs set, no. of viable embryos, no. of live 3 week embryos, no. hatched, no. of 14-day survivors, average weight of 14-day-old survivors, mortality, gross pathology, others)	- eggs laid - eggs cracked - eggshell thickness - eggs set - viable embryos - live 3-week embryos - number of hatchlings - hatchling body weight - number of 14-day-old survivors - 14-day-old survivor body weight	*EPA requires:* • *Eggs laid/pen* • *Eggs cracked/pen* • *Eggs set/pen* • *Viable embryos/pen* • *Live 3-week embryos/pen* • *Normal hatchlings/pen* • *14-day-old survivors/pen* • *Weights of 14-day-old survivors (mean per pen)* • *Egg shell thickness* • *Food consumption (mean per pen)* • *Initial and final body weight (mean per pen)*
Indicate if the test material was regurgitated	No indications of regurgitation.	
Observation intervals (for various parameters)	Parental and hatchling mortality and signs of toxicity were recorded once daily. Parental body weights were recorded at Weeks 1 (test initiation), 2, 4, 6, 8 and 20 (test termination). Parental food consumption was determined weekly.	*Body weights and food consumption must be measured at least biweekly.*
Were raw data included?	Yes, sufficient.	

II. RESULTS AND DISCUSSION:

A. MORTALITY:

No treatment-related mortality was observed during the study; however, three incidental deaths occurred at the 1000 ppm a.i. treatment level.

The first mortality in the 1000 ppm a.i. group was a male found dead on Day 0 of Week 9, with no signs of toxicity observed prior to death. Upon necropsy examination, the bird was observed to have a broken neck (mid-cervical region) with associated subcutaneous hematoma. The second mortality was a female that was found dead on Day 1 of Week 12. Prior to death, the female was noted with an open head lesion, and at necropsy, the bird was noted to have an extensive head and neck lesion with necrotic margins. In addition, the bird was thin, with a loss of muscle mass and a prominent keel, the pericardium was covered with white plaques, the spleen was small and pale, the kidneys were pale, and egg yolk peritonitis was evident in the abdominal cavity. The third mortality was a female that was euthanized on Day 5 of Week 20. Prior to euthanasia, the female was noted with lesions on both feet and exhibited wing droop, reduced reaction to external stimuli, lower limb weakness, and lethargy. At necropsy, the bird was emaciated (110 g), with a loss of muscle mass and a prominent keel, and had lesions on both feet and legs, feather loss on the back and rump, a small spleen, firm cecal contents of the GI tract, slightly pale kidneys, and a regressing ovary. In all three cases, necropsy of the pen-mates were unremarkable.

No other mortalities were observed during the study, and due to the nature of lesions observed at necropsy, none of the mortalities that occurred were considered to be treatment related. The LOAEC for adult mortality was >1000 ppm a.i..

Table 4: Effect of Metolachlor on Mortality of *Colinus virginianus*.

Treatment, ppm a.i. measured (and nominal) concentrations	Observation Period					
	Weeks 1-7		Weeks 8-14		Weeks 15-20	
	No. Dead		No. Dead		No. Dead	
	Male	Female	Male	Female	Male	Female
Control	0	0	0	0	0	0
161 (160)	0	0	0	0	0	0
403 (400)	0	0	0	0	0	0
1010 (1000)	0	0	1	1	1	2

B. REPRODUCTIVE AND OTHER ENDPOINTS:

Abnormal Effects/Behavior: No overt signs of toxicity were observed in any treatment group, and except for incidental clinical findings, all birds appeared normal throughout the study. Incidental clinical observations normally associated with pen wear and/or interactions among pen mates were observed and included feather loss, head bruising, lameness, and foot, neck, and head lesions. One bird was noted to have a small growth under an eyelid. The LOAEC for clinical signs of toxicity was >1000 ppm a.i..

Food Consumption: Although there were occasional slight differences observed between the control group and the 160, 400, and 1000 ppm a.i. treatment groups, there were no apparent treatment-related effects on feed consumption. Statistically-significant increases in mean weekly food consumption were observed at 12, 13, 14, and 20 weeks at the 160 ppm a.i. level, at 1, 2, 3, 6, and 14 weeks at the 400 ppm a.i. level, and at 6 weeks at the 1000 ppm a.i. level. These differences were slight, and were not concentration dependent or consistent during the test period. Therefore, the differences observed were considered to be unrelated to treatment, and the LOAEC for feed consumption was >1000 ppm a.i.. Overall feed consumption averaged 17, 18, 18, and 18 g/bird/day for the control, 160, 400, and 1000 ppm a.i. groups, respectively (reviewer-calculated).

Body Weight: No treatment-related effects on body weight were observed, with no statistically-significant differences between the control and any treatment group at any interval. The LOAEC for adult body weight was >1000 ppm a.i..

Necropsy: There were no findings at necropsy that were related to treatment with metolachlor. The LOAEC for post-mortem findings was >1000 ppm a.i..

Reproductive Effects: No treatment-related effects were observed on egg production or quality, fertility, embryonic development, hatchability, or survival of hatchlings at the 160 or 400 ppm a.i. treatment levels (see egg shell thickness discussion below). At the 160 ppm a.i. test concentration, there was a slight statistically-significant increase ($p<0.05$) in egg production (percentage of eggs laid of maximum number laid) that also resulted in statistically-significant increases ($p<0.05$) in hatchlings (percentage of hatchlings of maximum number of eggs set) and 14-day old survivors (percentage of 14-day old survivors or maximum number of eggs set). Since the increase in egg production at the 160 ppm a.i. level was slight, not concentration responsive, and represented an improvement in reproductive performance, the difference was not considered to be treatment-related. There were no statistically-significant differences between the control group and the 400 ppm a.i. treatment group for any of the reproductive parameters measured; however, there appeared to be a slight reduction in the percentage of viable embryos of eggs set (86 versus 91% for the control group). The slight difference was the result of data from one pen (Pen 648) where only two of the 46 eggs set contained viable embryos. When data from this pen were eliminated, the percentage of viable embryos (91%) was identical to the control group.

There were no apparent treatment-related effects upon egg shell thickness in the 160 or 400 ppm a.i. treatment groups. Very slight, but statistically-significant reductions in egg shell thickness at the 160 ppm a.i. test level ($p<0.05$) and at the 400 ppm a.i. test level ($p<0.01$) were observed when compared to the control group; however, these differences were considered neither treatment-related nor biologically meaningful. The statistical significance resulted primarily from the substantially higher-than-average performance and inordinately tight standard deviation of the control group (0.234 ± 0.009 mm). Results were compared to historical control values as summarized in the following table. The 0.222 ± 0.012 mm and 0.219 ± 0.015 mm egg shell thickness values for the 160 and 400 ppm a.i. test levels, respectively, were essentially identical to the overall historical control value for this parameter (0.220 ± 0.010 mm). It was concluded that given that the values observed were comparable to typical values observed for this parameter, and that there were no impacts upon the percentage of cracked eggs in these two groups, the statistical differences observed were not considered to be biologically meaningful.

Egg Shell Thickness Comparisons

Treatment level	Mean, mm	Standard Deviation, mm
Definitive Study Control	0.234	0.009
Historical Control 196 studies (1983-present)	0.220	0.010
Historical Control 20 studies (2000-present)[1]	0.228	0.015
Historical Control 4 most-recent studies[2]	0.224	0.014
Definitive 160 ppm a.i.[2]	0.222	0.012
Definitive 400 ppm a.i.[2]	0.219	0.015

[1] Birds from the same supplier.
[2] No statistically-significant differences were observed when this historical control group was compared to the 160 and 400 ppm a.i. treatment level results (Dunnett's multiple comparison procedure).

At the 1000 ppm a.i. treatment level, there was a statistically-significant ($p<0.05$) increase in the percentage of cracked eggs of eggs laid (6 versus 1% for the control group), which was correlated with a statistically-significant decrease ($p<0.01$) in egg shell thickness (0.217 versus 0.234 mm for the control group) and considered to be both treatment-related and biologically meaningful. Three pens (Pens 651, 660, and 664) in the 1000 ppm a.i. level had egg shell thickness values of ≤0.199 mm, with the percentage of cracked eggs between 10 and 24%. Given the degree of correlation between the effects on thickness and the percentage of cracked eggs, the differences observed were considered to be treatment-related. In addition, although not statistically significant, there was a slight decrease in the percentage of viable embryos of eggs set (84 versus 91% for the control group). The slight reduction in viability was due to the performance of three pens (Pens 651, 662, and 663) that had viability values of <75%, and a treatment-related effect could not be precluded.

It was noted that even with an effect upon the percentage of eggs cracked, and a possible effect upon viability, that there was no impact upon overall offspring production at the 1000 ppm a.i. test concentration. Reproductive success, as defined by the number of 14-day old survivors/hen was equivalent to or better than the control group at all test concentrations. The control group had an average 29 14-day old survivors/hen, the 160, 400, and 1000 ppm a.i. treatment groups produced 40, 30, and 31 14-day old survivors/hen, respectively.

No overt signs of toxicity in hatchlings were reported, and no treatment-related effect on offspring body weights were observed at any treatment level.

Based on a reduction in egg shell thickness and a corresponding increase in the percentage of cracked eggs of eggs laid, the LOAEC for effects on reproduction was 1000 ppm a.i..

Table 5: Reproductive and other parameters (nominal concentrations; study author-reported).

Parameter	Control	160 ppm a.i.	400 ppm a.i.	1000 ppm a.i.	NOAEC/ LOAEC
Eggs laid	658	825	750	614	N/A
Eggs laid/hen	41	52	47	47	1000 ppm >1000 ppm
Eggs laid/hen/day	0.45	0.56	0.51	0.51	1000 ppm >1000 ppm
Eggs laid/maximum laid (%)	61	77*	70	71	1000 ppm >1000 ppm
Eggs cracked	6	10	13	29	N/A
Eggs cracked/eggs laid (%)	1	1	2	6*	400 ppm 1000 ppm
Shell thickness (mm ± SD)	0.234 ± 0.009	0.222 ± 0.012*	0.219 ± 0.015**	0.217 ± 0.017**	400 ppm 1000 ppm
Eggs set	578	737	662	516	N/A
Viable embryos	526	693	558	441	N/A
Viable embryos/eggs set (%)	91	94	86	84^	400 ppm 1000 ppm
Live 3-week embryos	521	692	552	438	N/A
Live 3-week embryos/viable embryos (%)	99	100	99	98	1000 ppm >1000 ppm
No. of hatchlings	486	659	518	414	N/A
No. of hatchlings/live 3-week embryos (%)	94	95	95	93	1000 ppm >1000 ppm
No. of hatchlings/eggs set (%)	85	89	80	79	1000 ppm >1000 ppm
Hatchling weight (g ± SD)	6 ± 0	6 ± 0	6 ± 1	6 ± 0	1000 ppm >1000 ppm
No. of 14-day old survivors	457	639	480	397	N/A
No. of 14-day old survivors/hen	29	40	30	31	1000 ppm >1000 ppm
No. of 14-day old survivors/No. of hatchlings (%)	94	97	93	94	1000 ppm >1000 ppm

Parameter	Control	160 ppm a.i.	400 ppm a.i.	1000 ppm a.i.	NOAEC/ LOAEC
No. of 14-day old survivors/-eggs set (%)	80	87	75	75	1000 ppm >1000 ppm
14-day old survivors weight (g ± SD)	30 ± 2	30 ± 2	28 ± 1	30 ± 3	1000 ppm >1000 ppm
Mean adult food consumption (g/pen/day)[1]	17	18	18	18	1000 ppm >1000 ppm
Weight of adult males, g at start of treatment: at Week 8: at Week 20 (study termination):	 213 210 220	 208 208 220	 209 209 220	 209 207 211	 1000 ppm >1000 ppm
Weight of adult females, g at start of treatment: at Week 8: at Week 20 (study termination):	 208 203 227	 207 206 239	 202 200 233	 207 202 246	 1000 ppm >1000 ppm
Gross pathology (pathological incidents at study termination)	No treatment-related abnormalities observed.				

N/A = Not statistically-analyzed.
^ Not statistically significant, but considered a possible treatment-related effect.
* Statistically different from the control at $p<0.05$.
** Statistically different from the control at $p<0.01$.
[1] Reviewer-calculated from mean weekly data.

C. REPORTED STATISTICS:

The following variables were statistically analyzed: adult body weight, adult feed consumption, eggs laid of maximum laid, eggs cracked of eggs laid, viable embryos of eggs set, live 3-week embryos of viable embryos, hatchlings of 3-week embryos, 14-day old survivors of hatchlings, hatchlings of eggs set, 14-day old survivors of eggs set, hatchlings of maximum set, 14-day old survivors of maximum set, egg shell thickness, and offspring's body weight.

An analysis of variance (ANOVA) was performed to determine statistically-significant differences between groups. Dunnett's multiple comparison procedure was then used to compare the treatment means with the control group mean. Sample units were the individual pens within each experimental group, except adult body weights, where the sample unit was the individual bird. Percentage data were examined using Dunnett's method following arcsine square root transformation. Nominal concentrations were used for all estimations.

D. VERIFICATION OF STATISTICAL RESULTS:

Statistical Method: Analysis was conducted using "chicks.sas" (Ver. 3; March 2002), a SAS program developed by EFED/OPP/USEPA. Data for all endpoints were examined graphically using box plots to determine if they exhibited a dose-dependent response, which was ultimately used to select the multiple comparison test to detect LOAEC and NOAEC. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests and data that did not satisfy these assumptions were subjected to the non-parametric Mann Whitney-U (with a Bonferroni adjustment) and Jonckheere's tests. Data for dead birds were excluded from the analyses. See Appendix I for output of reviewer's statistical verification and graphs for affected endpoints to support any reviewer-generated conclusions that may differ from those reported in the study.

Table 6. Reproductive and other parameters (mean-measured concentrations; reviewer-reported).

Parameter	Control	161 ppm a.i.	403 ppm a.i.	1010 ppm a.i.	NOAEC/ LOAEC
Eggs laid/pen	41.1	51.6	46.9	47.2	1010 ppm >1010 ppm
Eggs cracked/pen	0.38	0.63	0.81	2.23*	403 ppm 1010 ppm
Eggs not cracked/ eggs laid (%)	99.1	98.7	98.2	94.1*	403 ppm 1010 ppm
Eggs set/pen	36.1	46.1	41.4	39.7	1010 ppm >1010 ppm
Shell thickness	0.23	0.22*	0.22*	0.22*	<161 ppm 161 ppm
Eggs set/eggs laid (%)	87.1	89.1	87.8	82.2	1010 ppm >1010 ppm
Viable embryo/pen	32.9	43.3	34.9	33.9	1010 ppm >1010 ppm
Viable embryos/ eggs set (%)	91.3	94.0	86.0	84.1	1010 ppm >1010 ppm
Live embryos/pen	32.6	43.3	34.5	33.7	1010 ppm >1010 ppm
Live embryo/ viable embryo (%)	99.2	99.9	98.9	98.5	1010 ppm >1010 ppm
No. of hatchlings/pen	30.4	41.2	32.4	31.9	1010 ppm >1010 ppm
No. of hatchlings/ eggs laid (%)	73.9	79.6	70.5	65.0	1010 ppm >1010 ppm

Parameter	Control	161 ppm a.i.	403 ppm a.i.	1010 ppm a.i.	NOAEC/ LOAEC
No. of hatchlings/ eggs set (%)	85.0	89.4	80.3	78.6	1010 ppm >1010 ppm
No. of hatchlings/ live embryos (%)	94.1	95.2	94.6	93.4	1010 ppm >1010 ppm
Hatchling survival/pen	28.6	40.0	30.0	30.5	1010 ppm >1010 ppm
Hatchling survival/ eggs set (%)	80.0	86.7	74.6	75.3	1010 ppm >1010 ppm
Hatchling survival/ no. of hatchlings (%)	94.0	97.0	93.1	93.6	1010 ppm >1010 ppm
Hatchling weight (g)	6.4	6.4	6.2	6.5	1010 ppm >1010 ppm
Survivor weight (g)	29.9	29.8	28.4*	29.5	161 ppm 403 ppm
Mean food consumption (g/bird/day)	17.1	18.5	18.1	18.3	1010 ppm >1010 ppm
Male weight gain (g)	7.7	11.7	10.2	5.1	1010 ppm >1010 ppm
Female weight gain (g)	19.5	32.2	31.1	38.8	1010 ppm >1010 ppm

*Statistically significant at $p<0.05$

E. STUDY DEFICIENCIES:

There were no significant deviations from U.S. EPA guideline §71-4(a) that affected the validity or acceptability of this study.

F. REVIEWER'S COMMENTS:

Although statistically significant effects were noted in four parameters: eggshell thickness, day 14 survivor weight, eggs cracked, and percentage eggs not cracked of eggs laid, it appears only two of these are biologically significant, the eggs cracked, and percentage eggs not cracked of eggs laid. The significant parameters were affected at the highest concentration, 1010 ppm a.i. These results have been used to establish the NOAEC and the LOAEC.

Using mean body weights and mean feed consumption data, the estimated daily dietary dose was determined to be 13.9, 34.6, and 85.9 mg/kg bw/day for the 160, 400, and 1000 ppm a.i. treatment levels, respectively.

Individual stocks of the test substance were prepared at the beginning and end of the study to check the purity of metolachlor. The mean of the three stocks at study initiation and termination were 100.2 and 101.3%, respectively. Those values confirm the purity value of 97.2% originally supplied by the sponsor.

Offspring received basal diet without the addition of test substance or limestone. In addition, offspring received a water-soluble vitamin and electrolyte mix in their water. Neither the adults nor offspring received any form of medication in their feed during the test.

G. CONCLUSIONS:

A statistically and biologically significant increase in eggs cracked (p=0.02) occurred at the highest dose, with mean number of eggs cracking increasing with dose. The highest dose (1010 ppm a.i.) is the LOAEC for northern bobwhite quail, and 403 ppm a.i. is the NOAEC.

This study is scientifically sound, and is classified as ACCEPTABLE.

Results Synopsis

Test Organism Size/Age: Approx. 26 weeks old at test initiation (178-244 g)

NOAEC: 403 ppm a.i.
LOAEC: 1010 ppm a.i.
Endpoint(s) Affected: Egg quality (Eggs cracked and percentage of eggs cracked).

III. REFERENCES:

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APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Bobwhite repro, metolachlor, MRID 465089-01
PRINTOUT OF RAW DATA

Obs	TRT	EL	EC	ENC_EL	ES	ES_EL	VE	VE_ES	LE	LE_VE	NH	NH_EL	NH_ES
1	Ctrl	48	1	97.92	42	87.50	40	95.24	40	100.00	40	83.33	95.24
2	Ctrl	33	0	100.00	29	87.88	24	82.76	24	100.00	24	72.73	82.76
3	Ctrl	16	0	100.00	13	81.25	12	92.31	12	100.00	12	75.00	92.31
4	Ctrl	43	0	100.00	38	88.37	38	100.00	36	94.74	35	81.40	92.11
5	Ctrl	46	0	100.00	42	91.30	30	71.43	30	100.00	30	65.22	71.43
6	Ctrl	58	0	100.00	53	91.38	46	86.79	46	100.00	45	77.59	84.91
7	Ctrl	52	1	98.08	46	88.46	45	97.83	44	97.78	38	73.08	82.61
8	Ctrl	49	1	97.96	43	87.76	41	95.35	41	100.00	28	57.14	65.12
9	Ctrl	19	0	100.00	16	84.21	15	93.75	15	100.00	15	78.95	93.75
10	Ctrl	51	0	100.00	46	90.20	45	97.83	44	97.78	43	84.31	93.48
11	Ctrl	56	0	100.00	51	91.07	42	82.35	42	100.00	40	71.43	78.43
12	Ctrl	35	1	97.14	29	82.86	24	82.76	24	100.00	23	65.71	79.31
13	Ctrl	44	0	100.00	40	90.91	37	92.50	37	100.00	36	81.82	90.00
14	Ctrl	33	1	96.97	28	84.85	28	100.00	28	100.00	27	81.82	96.43
15	Ctrl	36	1	97.22	28	77.78	27	96.43	26	96.30	23	63.89	82.14
16	Ctrl	39	0	100.00	34	87.18	32	94.12	32	100.00	27	69.23	79.41
17	Dose1	43	0	100.00	38	88.37	36	94.74	36	100.00	32	74.42	84.21
18	Dose1	56	0	100.00	50	89.29	48	96.00	48	100.00	47	83.93	94.00
19	Dose1	55	2	96.36	48	87.27	43	89.58	43	100.00	33	60.00	68.75
20	Dose1	58	1	98.28	52	89.66	52	100.00	52	100.00	52	89.66	100.00
21	Dose1	49	1	97.96	44	89.80	42	95.45	41	97.62	41	83.67	93.18
22	Dose1	47	0	100.00	41	87.23	35	85.37	35	100.00	35	74.47	85.37
23	Dose1	38	2	94.74	33	86.84	33	100.00	33	100.00	32	84.21	96.97
24	Dose1	64	1	98.44	58	90.63	58	100.00	58	100.00	53	82.81	91.38
25	Dose1	50	0	100.00	45	90.00	41	91.11	41	100.00	40	80.00	88.89
26	Dose1	43	2	95.35	36	83.72	35	97.22	35	100.00	34	79.07	94.44
27	Dose1	54	0	100.00	50	92.59	42	84.00	42	100.00	41	75.93	82.00
28	Dose1	67	0	100.00	62	92.54	60	96.77	60	100.00	60	89.55	96.77
29	Dose1	51	0	100.00	46	90.20	43	93.48	43	100.00	41	80.39	89.13
30	Dose1	53	0	100.00	48	90.57	44	91.67	44	100.00	41	77.36	85.42
31	Dose1	49	0	100.00	44	89.80	42	95.45	42	100.00	39	79.59	88.64
32	Dose1	48	1	97.92	42	87.50	39	92.86	39	100.00	38	79.17	90.48
33	Dose2	30	1	96.67	25	83.33	25	100.00	24	96.00	24	80.00	96.00
34	Dose2	30	0	100.00	26	86.67	25	96.15	24	96.00	22	73.33	84.62
35	Dose2	54	0	100.00	50	92.59	44	88.00	44	100.00	44	81.48	88.00
36	Dose2	40	0	100.00	35	87.50	34	97.14	34	100.00	33	82.50	94.29
37	Dose2	27	0	100.00	23	85.19	22	95.65	22	100.00	22	81.48	95.65
38	Dose2	34	2	94.12	29	85.29	28	96.55	28	100.00	27	79.41	93.10
39	Dose2	60	0	100.00	55	91.67	44	80.00	43	97.73	38	63.33	69.09
40	Dose2	59	1	98.31	53	89.83	42	79.25	42	100.00	41	69.49	77.36
41	Dose2	41	2	95.12	34	82.93	32	94.12	32	100.00	31	75.61	91.18
42	Dose2	49	0	100.00	44	89.80	39	88.64	39	100.00	34	69.39	77.27
43	Dose2	52	0	100.00	46	88.46	40	86.96	39	97.50	33	63.46	71.74
44	Dose2	57	0	100.00	52	91.23	48	92.31	47	97.92	40	70.18	76.92
45	Dose2	49	1	97.96	44	89.80	44	100.00	43	97.73	43	87.76	97.73
46	Dose2	58	0	100.00	53	91.38	49	92.45	49	100.00	48	82.76	90.57
47	Dose2	56	4	92.86	47	83.93	40	85.11	40	100.00	36	64.29	76.60
48	Dose2	54	2	96.30	46	85.19	2	4.35	2	100.00	2	3.70	4.35
49	Dose3	52	3	94.23	44	84.62	38	86.36	38	100.00	38	73.08	86.36
50	Dose3	51	0	100.00	46	90.20	45	97.83	45	100.00	43	84.31	93.48
51	Dose3	48	5	89.58	32	66.67	15	46.88	12	80.00	10	20.83	31.25
52	Dose3	53	3	94.34	45	84.91	42	93.33	42	100.00	41	77.36	91.11
53	Dose3	61	0	100.00	56	91.80	52	92.86	52	100.00	50	81.97	89.29
54	Dose3	.	.	.	.	.	.	.	.	.	.	.	.
55	Dose3	56	1	98.21	49	87.50	42	85.71	42	100.00	42	75.00	85.71
56	Dose3	57	0	100.00	52	91.23	51	98.08	51	100.00	45	78.95	86.54
57	Dose3	.	.	.	.	.	.	.	.	.	.	.	.

58	Dose3	.	.	.	.	.	.	.	.	.	.	.
59	Dose3	66	2	96.97	59	89.39	49	83.05	49	100.00	45	68.18	76.27
60	Dose3	34	8	76.47	21	61.76	20	95.24	20	100.00	20	58.82	95.24
61	Dose3	42	0	100.00	38	90.48	36	94.74	36	100.00	35	83.33	92.11
62	Dose3	38	0	100.00	34	89.47	21	61.76	21	100.00	19	50.00	55.88
63	Dose3	30	1	96.67	25	83.33	16	64.00	16	100.00	13	43.33	52.00
64	Dose3	26	6	76.92	15	57.69	14	93.33	14	100.00	13	50.00	86.67

Bobwhite repro, metolachlor, MRID 465089-01
PRINTOUT OF RAW DATA (continued)

Obs	TRT	NH_LE	HS	HS_ES	HS_NH	THICK	HATWT	SURVWT	FOOD	WTGAINM	WTGAINF
1	Ctrl	100.00	39	92.86	97.50	0.22	6	28	18	15	46
2	Ctrl	100.00	24	82.76	100.00	0.23	5	26	17	10	6
3	Ctrl	100.00	11	84.62	91.67	0.24	6	28	16	0	18
4	Ctrl	97.22	33	86.84	94.29	0.22	6	30	17	4	20
5	Ctrl	100.00	30	71.43	100.00	0.23	6	26	16	0	48
6	Ctrl	97.83	41	77.36	91.11	0.24	6	29	19	-1	54
7	Ctrl	86.36	30	65.22	78.95	0.23	7	30	16	6	32
8	Ctrl	68.29	24	55.81	85.71	0.24	7	32	17	3	41
9	Ctrl	100.00	14	87.50	93.33	0.23	6	33	15	9	-2
10	Ctrl	97.73	40	86.96	93.02	0.23	7	31	17	37	42
11	Ctrl	95.24	40	78.43	100.00	0.24	7	30	17	13	40
12	Ctrl	95.83	21	72.41	91.30	0.24	6	29	17	-2	-66
13	Ctrl	97.30	36	90.00	100.00	0.25	7	32	19	3	23
14	Ctrl	96.43	26	92.86	96.30	0.23	7	31	16	8	-6
15	Ctrl	88.46	21	75.00	91.30	0.23	6	32	19	6	-25
16	Ctrl	84.38	27	79.41	100.00	0.25	8	32	17	12	41
17	Dose1	88.89	32	84.21	100.00	0.22	6	27	16	10	17
18	Dose1	97.92	46	92.00	97.87	0.23	6	28	19	-8	35
19	Dose1	76.74	32	66.67	96.97	0.22	6	27	17	15	15
20	Dose1	100.00	48	92.31	92.31	0.23	6	30	19	6	15
21	Dose1	100.00	39	88.64	95.12	0.21	6	31	21	20	36
22	Dose1	100.00	33	80.49	94.29	0.21	7	32	17	19	51
23	Dose1	96.97	31	93.94	96.88	0.20	7	31	18	4	34
24	Dose1	91.38	50	86.21	94.34	0.24	7	31	19	4	52
25	Dose1	97.56	39	86.67	97.50	0.21	6	29	17	16	46
26	Dose1	97.14	32	88.89	94.12	0.22	6	31	17	9	38
27	Dose1	97.62	41	82.00	100.00	0.23	7	29	20	18	50
28	Dose1	100.00	59	95.16	98.33	0.22	6	31	18	-4	18
29	Dose1	95.35	40	86.96	97.56	0.22	7	30	23	22	5
30	Dose1	93.18	41	85.42	100.00	0.24	6	31	20	22	47
31	Dose1	92.86	38	86.36	97.44	0.23	6	27	18	35	20
32	Dose1	97.44	38	90.48	100.00	0.21	7	32	17	-1	36
33	Dose2	100.00	22	88.00	91.67	0.22	6	29	17	10	35
34	Dose2	91.67	19	73.08	86.36	0.22	5	26	17	30	32
35	Dose2	100.00	43	86.00	97.73	0.22	6	28	18	15	33
36	Dose2	97.06	33	94.29	100.00	0.23	6	28	19	26	33
37	Dose2	100.00	21	91.30	95.45	0.21	7	31	15	-19	-11
38	Dose2	96.43	26	89.66	96.30	0.20	7	28	20	-8	-5
39	Dose2	88.37	32	58.18	84.21	0.21	6	27	18	20	35
40	Dose2	97.62	30	56.60	73.17	0.19	6	28	17	19	57
41	Dose2	96.88	29	85.29	93.55	0.22	6	30	16	14	33
42	Dose2	87.18	32	72.73	94.12	0.24	6	28	20	-1	32
43	Dose2	84.62	31	67.39	93.94	0.25	6	30	24	19	40
44	Dose2	85.11	40	76.92	100.00	0.23	6	27	17	7	9
45	Dose2	100.00	40	90.91	93.02	0.21	6	29	17	8	50
46	Dose2	97.96	47	88.68	97.92	0.22	6	28	17	26	36
47	Dose2	90.00	33	70.21	91.67	0.21	7	29	20	14	42
48	Dose2	100.00	2	4.35	100.00	0.23	8	29	18	-16	47
49	Dose3	100.00	37	84.09	97.37	0.20	6	28	19	7	33
50	Dose3	95.56	41	89.13	95.35	0.23	7	32	19	9	67
51	Dose3	83.33	5	15.63	50.00	0.20	6	31	19	1	45
52	Dose3	97.62	39	86.67	95.12	0.22	7	33	17	23	44

53	Dose3	96.15	48	85.71	96.00	0.23	7	29	18	-11	52
54	Dose3	.	.	.	.	.	.	.	.	.	.
55	Dose3	100.00	41	83.67	97.62	0.20	7	32	18	3	25
56	Dose3	88.24	45	86.54	100.00	0.26	6	27	18	8	38
57	Dose3	.	.	.	.	.	.	.	.	.	.
58	Dose3	.	.	.	.	.	.	.	.	.	.
59	Dose3	91.84	43	72.88	95.56	0.21	8	29	21	-1	78
60	Dose3	100.00	19	90.48	95.00	0.20	7	29	17	11	48
61	Dose3	97.22	35	92.11	100.00	0.22	6	32	22	-13	62
62	Dose3	90.48	18	52.94	94.74	0.23	6	24	17	12	-37
63	Dose3	81.25	13	52.00	100.00	0.23	6	24	18	10	18
64	Dose3	92.86	13	86.67	100.00	0.20	6	34	15	7	32

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE EL (Eggs Laid)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.968	0.116	2.012	0.122	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf.	Interval
Ctrl	16	41.13	12.08	3.02	29.37	34.69,	47.56
Dose1	16	51.56	7.55	1.89	14.63	47.54,	55.58
Dose2	16	46.88	11.48	2.87	24.50	40.76,	52.99
Dose3	13	47.23	12.32	3.42	26.08	39.79,	54.67

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	43.50	16.00	58.00	.	.
Dose1	50.50	38.00	67.00	125.38	-25.38
Dose2	50.50	27.00	60.00	113.98	-13.98
Dose3	51.00	26.00	66.00	114.85	-14.85

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	57	2.44	0.073

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	41.13	.	46.67	.	0.044	0.453	0.449	.	.
Dose1	51.56	1.000	46.67	0.962	.	0.623	0.716	.	.
Dose2	46.88	0.991	46.67	0.974	.	.	1.000	.	.
Dose3	47.23	0.992	46.67	0.974	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE NEG_EC (Eggs Cracked)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.865	<.001	12.487	<.001	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval	
Ctrl	16	0.38	0.50	0.13	133.33	0.11,	0.64
Dose1	16	0.63	0.81	0.20	129.00	0.20,	1.05
Dose2	16	0.81	1.17	0.29	143.66	0.19,	1.43
Dose3	13	2.23	2.65	0.74	118.82	0.63,	3.83

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	0.00	0.00	1.00	.	.
Dose1	0.00	0.00	2.00	166.67	-66.67
Dose2	0.00	0.00	4.00	216.67	-116.67
Dose3	1.00	0.00	8.00	594.87	-494.87

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	5.19	0.159

MannWhit(Bon) - testing each trt median signif. greater than control
Jonckheere - test assumes dose-response relationship, testing positive trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	0.00	.	.
Dose1	0.00	1.000	0.231
Dose2	0.00	1.000	0.184
Dose3	1.00	0.078	0.016

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	**Dose2**	**Dose3**

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE ENC_EL ((EL-EC)/EL (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.744	<.001	10.236	<.001	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	99.08	1.26	0.31	1.27	98.41, 99.75
Dose1	16	98.69	1.81	0.45	1.83	97.73, 99.65
Dose2	16	98.21	2.45	0.61	2.49	96.90, 99.51
Dose3	13	94.11	8.33	2.31	8.85	89.08, 99.14

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	100.00	96.97	100.00	.	.
Dose1	100.00	94.74	100.00	99.61	0.39
Dose2	100.00	92.86	100.00	99.12	0.88
Dose3	96.97	76.47	100.00	94.98	5.02

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	4.63	0.201

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	100.00	.	.
Dose1	100.00	1.000	0.351
Dose2	100.00	1.000	0.226
Dose3	96.97	0.086	0.024

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	**Dose2**	**Dose3**

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE ES (Eggs Set)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.972	0.169	2.523	0.067	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	36.13	11.59	2.90	32.07	29.95, 42.30
Dose1	16	46.06	7.57	1.89	16.43	42.03, 50.09
Dose2	16	41.38	11.02	2.76	26.64	35.50, 47.25
Dose3	13	39.69	13.64	3.78	34.37	31.45, 47.94

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	39.00	13.00	53.00	.	.
Dose1	45.50	33.00	62.00	127.51	-27.51
Dose2	45.00	23.00	55.00	114.53	-14.53
Dose3	44.00	15.00	59.00	109.87	-9.87

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	57	2.23	0.094

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	36.13	.	41.19	.	0.063	0.537	0.822	.	.
Dose1	46.06	1.000	41.19	0.949	.	0.628	0.416	.	.
Dose2	41.38	0.987	41.19	0.963	.	.	0.977	.	.
Dose3	39.69	0.954	39.69	0.915	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE ES_EL (EggsSet/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.836	<.001	12.775	<.001	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	87.06	3.94	0.99	4.53	84.96, 89.16
Dose1	16	89.12	2.25	0.56	2.52	87.93, 90.32
Dose2	16	87.80	3.21	0.80	3.66	86.09, 89.51
Dose3	13	82.23	11.95	3.31	14.53	75.01, 89.45

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	87.82	77.78	91.38	.	.
Dose1	89.73	83.72	92.59	102.37	-2.37
Dose2	87.98	82.93	92.59	100.85	-0.85
Dose3	87.50	57.69	91.80	94.46	5.54

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	2.73	0.434

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	87.82	.	.
Dose1	89.73	1.000	0.875
Dose2	87.98	1.000	0.619
Dose3	87.50	1.000	0.279

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE VE (Viable Embryo(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.968	0.106	3.509	0.021	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	32.88	10.61	2.65	32.28	27.22, 38.53
Dose1	16	43.31	7.83	1.96	18.08	39.14, 47.48
Dose2	16	34.88	12.22	3.05	35.04	28.36, 41.39
Dose3	13	33.92	14.60	4.05	43.03	25.10, 42.74

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	34.50	12.00	46.00	.	.
Dose1	42.00	33.00	60.00	131.75	-31.75
Dose2	39.50	2.00	49.00	106.08	-6.08
Dose3	38.00	14.00	52.00	103.19	-3.19

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	5.91	0.116

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	34.50	.	.
Dose1	42.00	1.000	0.994
Dose2	39.50	1.000	0.767
Dose3	38.00	1.000	0.577

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE VE_ES (ViableEmbryo/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.674	<.001	2.229	0.095	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	91.34	7.97	1.99	8.72	87.09, 95.59
Dose1	16	93.98	4.79	1.20	5.10	91.43, 96.53
Dose2	16	86.04	22.70	5.68	26.39	73.94, 98.14
Dose3	13	84.09	16.24	4.50	19.31	74.28, 93.90

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	93.93	71.43	100.00	.	.
Dose1	95.10	84.00	100.00	102.89	-2.89
Dose2	92.38	4.35	100.00	94.20	5.80
Dose3	92.86	46.88	98.08	92.06	7.94

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	3.50	0.320

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	93.93	.	.
Dose1	95.10	1.000	0.775
Dose2	92.38	1.000	0.338
Dose3	92.86	0.423	0.091

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE LE (Live Embryo(d21))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.969	0.124	3.717	0.016	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	32.56	10.45	2.61	32.09	26.99, 38.13
Dose1	16	43.25	7.84	1.96	18.14	39.07, 47.43
Dose2	16	34.50	12.14	3.03	35.18	28.03, 40.97
Dose3	13	33.69	14.94	4.14	44.35	24.66, 42.72

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	34.00	12.00	46.00	.	
Dose1	42.00	33.00	60.00	132.82	-32.82
Dose2	39.00	2.00	49.00	105.95	-5.95
Dose3	38.00	12.00	52.00	103.47	-3.47

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	6.11	0.106

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	34.00	.	.
Dose1	42.00	1.000	0.994
Dose2	39.00	1.000	0.740
Dose3	38.00	1.000	0.564

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE LE_VE (LiveEmbryo/ViableEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.466	<.001	3.112	0.033	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	99.16	1.63	0.41	1.65	98.29, 100.00
Dose1	16	99.85	0.60	0.15	0.60	99.53, 100.00
Dose2	16	98.93	1.52	0.38	1.53	98.12, 99.74
Dose3	13	98.46	5.55	1.54	5.63	95.11, 100.00

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	100.00	94.74	100.00	.	.
Dose1	100.00	97.62	100.00	100.70	-0.70
Dose2	100.00	96.00	100.00	99.77	0.23
Dose3	100.00	80.00	100.00	99.29	0.71

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	5.83	0.120

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	100.00	.	.
Dose1	100.00	1.000	0.924
Dose2	100.00	1.000	0.205
Dose3	100.00	1.000	0.574

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE NH (Number Hatched)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.975	0.244	3.559	0.020	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	30.38	9.74	2.43	32.05	25.19, 35.56
Dose1	16	41.19	8.11	2.03	19.69	36.87, 45.51
Dose2	16	32.38	11.29	2.82	34.87	26.36, 38.39
Dose3	13	31.85	14.51	4.03	45.57	23.08, 40.62

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	29.00	12.00	45.00	.	.
Dose1	40.50	32.00	60.00	135.60	-35.60
Dose2	33.50	2.00	48.00	106.58	-6.58
Dose3	38.00	10.00	50.00	104.84	-4.84

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	7.06	0.070

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	29.00	.	.
Dose1	40.50	1.000	0.997
Dose2	33.50	1.000	0.755
Dose3	38.00	1.000	0.658

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE NH_EL (NumberHatched/EggsLaid (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.813	<.001	3.643	0.018	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	73.91	8.05	2.01	10.89	69.62, 78.21
Dose1	16	79.64	6.95	1.74	8.72	75.94, 83.34
Dose2	16	70.51	19.39	4.85	27.50	60.18, 80.84
Dose3	13	65.01	19.21	5.33	29.55	53.40, 76.62

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	74.04	57.14	84.31	.	.
Dose1	79.80	60.00	89.66	107.74	-7.74
Dose2	74.47	3.70	87.76	95.39	4.61
Dose3	73.08	20.83	84.31	87.96	12.04

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	7.33	0.062

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	74.04	.	.
Dose1	79.80	1.000	0.977
Dose2	74.47	1.000	0.519
Dose3	73.08	0.617	0.122

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE NH_ES (NumberHatched/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.770	<.001	2.834	0.046	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	84.96	9.01	2.25	10.61	80.16, 89.77
Dose1	16	89.35	7.44	1.86	8.33	85.38, 93.32
Dose2	16	80.28	22.30	5.57	27.78	68.40, 92.16
Dose3	13	78.61	19.71	5.47	25.07	66.70, 90.52

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	83.83	65.12	96.43	.	
Dose1	89.80	68.75	100.00	105.16	-5.16
Dose2	86.31	4.35	97.73	94.49	5.51
Dose3	86.54	31.25	95.24	92.52	7.48

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	3.09	0.378

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	83.83	.	.
Dose1	89.80	1.000	0.929
Dose2	86.31	1.000	0.485
Dose3	86.54	1.000	0.241

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE NH_LE (NumberHatched/LiveEmbryo (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.829	<.001	0.620	0.605	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	94.07	8.50	2.12	9.03	89.54, 98.59
Dose1	16	95.19	5.93	1.48	6.23	92.03, 98.35
Dose2	16	94.56	5.74	1.43	6.07	91.50, 97.61
Dose3	13	93.43	6.21	1.72	6.64	89.68, 97.18

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	97.26	68.29	100.00	.	.
Dose1	97.29	76.74	100.00	101.19	-1.19
Dose2	96.97	84.62	100.00	100.52	-0.52
Dose3	95.56	81.25	100.00	99.32	0.68

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	0.92	0.821

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	97.26	.	.
Dose1	97.29	1.000	0.500
Dose2	96.97	1.000	0.428
Dose3	95.56	0.629	0.211

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE HS (Hatching Survival(d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.976	0.269	4.063	0.011	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval	
Ctrl	16	28.56	9.27	2.32	32.47	23.62,	33.50
Dose1	16	39.94	7.72	1.93	19.34	35.82,	44.05
Dose2	16	30.00	10.81	2.70	36.02	24.24,	35.76
Dose3	13	30.54	14.66	4.07	48.01	21.68,	39.40

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	28.50	11.00	41.00	.	.
Dose1	39.00	31.00	59.00	139.82	-39.82
Dose2	31.50	2.00	47.00	105.03	-5.03
Dose3	37.00	5.00	48.00	106.92	-6.92

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	9.55	0.023

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	28.50	.	.
Dose1	39.00	1.000	0.999
Dose2	31.50	1.000	0.692
Dose3	37.00	1.000	0.639

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE HS_ES (HatchingSurvival/EggsSet (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.791	<.001	3.961	0.012	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	79.97	10.26	2.57	12.84	74.50, 85.44
Dose1	16	86.65	6.72	1.68	7.75	83.07, 90.23
Dose2	16	74.60	22.20	5.55	29.76	62.77, 86.43
Dose3	13	75.27	22.28	6.18	29.59	61.81, 88.73

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	81.09	55.81	92.86	.	.
Dose1	86.81	66.67	95.16	108.36	-8.36
Dose2	81.11	4.35	94.29	93.29	6.71
Dose3	85.71	15.63	92.11	94.13	5.87

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	4.55	0.208

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	81.09	.	.
Dose1	86.81	1.000	0.972
Dose2	81.11	1.000	0.496
Dose3	85.71	1.000	0.321

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE HS_NH (HatchingSurvival/NumberHatched (%))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.663	<.001	1.527	0.217	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	94.03	5.90	1.48	6.28	90.89, 97.18
Dose1	16	97.04	2.42	0.60	2.49	95.76, 98.33
Dose2	16	93.07	6.98	1.75	7.50	89.35, 96.79
Dose3	13	93.60	13.27	3.68	14.18	85.58, 100.00

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	93.81	78.95	100.00	.	.
Dose1	97.47	92.31	100.00	103.21	-3.21
Dose2	94.03	73.17	100.00	98.98	1.02
Dose3	96.00	50.00	100.00	99.54	0.46

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	4.74	0.191

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	93.81	.	.
Dose1	97.47	1.000	0.936
Dose2	94.03	1.000	0.402
Dose3	96.00	1.000	0.701

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE THICK (Eggshell thickness)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.978	0.323	2.246	0.093	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	0.23	0.01	0.00	3.72	0.23, 0.24
Dose1	16	0.22	0.01	0.00	5.22	0.22, 0.23
Dose2	16	0.22	0.01	0.00	6.63	0.21, 0.23
Dose3	13	0.22	0.02	0.00	8.01	0.21, 0.23

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	0.23	0.22	0.25	.	.
Dose1	0.22	0.20	0.24	94.61	5.39
Dose2	0.22	0.19	0.25	93.73	6.27
Dose3	0.22	0.20	0.26	92.82	7.18

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	57	5.02	0.004

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	0.23	.	0.23	.	0.044	0.014	0.006	.	.
Dose1	0.22	0.012	0.22	0.005	.	0.971	0.830	.	.
Dose2	0.22	0.004	0.22	0.001	.	.	0.973	.	.
Dose3	0.22	0.002	0.22	<.001	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	<lowest dose	Dose1
Williams	**<lowest dose**	**Dose1**

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE HATWT (Hatchling Weight)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.878	<.001	0.713	0.548	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	6.44	0.73	0.18	11.30	6.05, 6.83
Dose1	16	6.38	0.50	0.13	7.84	6.11, 6.64
Dose2	16	6.25	0.68	0.17	10.93	5.89, 6.61
Dose3	13	6.54	0.66	0.18	10.10	6.14, 6.94

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	6.00	5.00	8.00	.	.
Dose1	6.00	6.00	7.00	99.03	0.97
Dose2	6.00	5.00	8.00	97.09	2.91
Dose3	6.00	6.00	8.00	101.57	-1.57

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	1.76	0.624

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	6.00	.	.
Dose1	6.00	1.000	0.398
Dose2	6.00	1.000	0.162
Dose3	6.00	1.000	0.488

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE SURVWT (Survivor Wt (d14))

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.972	0.176	4.507	0.007	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	29.94	2.14	0.54	7.16	28.80, 31.08
Dose1	16	29.81	1.76	0.44	5.90	28.87, 30.75
Dose2	16	28.44	1.26	0.32	4.44	27.76, 29.11
Dose3	13	29.54	3.20	0.89	10.85	27.60, 31.47

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	30.00	26.00	33.00	.	.
Dose1	30.50	27.00	32.00	99.58	0.42
Dose2	28.00	26.00	31.00	94.99	5.01
Dose3	29.00	24.00	34.00	98.67	1.33

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	6.40	0.094

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	30.00	.	.
Dose1	30.50	1.000	0.380
Dose2	28.00	0.045	0.007
Dose3	29.00	1.000	0.110

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	**Dose1**	**Dose2**
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE FOOD (Food Consumption)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.936	0.003	1.199	0.318	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	17.06	1.18	0.30	6.92	16.43, 17.69
Dose1	16	18.50	1.83	0.46	9.87	17.53, 19.47
Dose2	16	18.13	2.13	0.53	11.73	16.99, 19.26
Dose3	13	18.31	1.80	0.50	9.82	17.22, 19.39

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	17.00	15.00	19.00	.	.
Dose1	18.00	16.00	23.00	108.42	-8.42
Dose2	17.50	15.00	24.00	106.23	-6.23
Dose3	18.00	15.00	22.00	107.30	-7.30

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

Degrees of Freedom	TestStat	P-value
3	7.24	0.065

MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	17.00	.	.
Dose1	18.00	1.000	0.993
Dose2	17.50	1.000	0.955
Dose3	18.00	1.000	0.973

SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE WTGAINM (Male wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.985	0.643	1.615	0.196	USE PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	7.69	9.37	2.34	121.91	2.69, 12.68
Dose1	16	11.69	11.26	2.82	96.38	5.68, 17.69
Dose2	16	10.25	14.62	3.65	142.61	2.46, 18.04
Dose3	13	5.08	9.59	2.66	188.83	-0.72, 10.87

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	6.00	-2.00	37.00	.	.
Dose1	12.50	-8.00	35.00	152.03	-52.03
Dose2	14.00	-19.00	30.00	133.33	-33.33
Dose3	7.00	-13.00	23.00	66.04	33.96

****

PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Analysis of Variance (ANOVA) - overall F-test

Numerator df	Denominator df	F-stat	P-value
3	57	0.93	0.434

Dunnett - testing each trt mean signif. less than control
Williams - test assumes dose-response relationship, testing negative trend
Tukey - two-sided tests, all possible comparisons, not used for NOAEC or LOAEC

Level	Mean	Dunnett p-value	Isotonic mean	Williams p-value	Tukey p-values Dose1	Dose2	Dose3	Dose4	Dose5
Ctrl	7.69	.	9.88	.	0.759	0.922	0.929	.	.
Dose1	11.69	0.965	9.88	0.789	.	0.985	0.421	.	.
Dose2	10.25	0.921	9.88	0.821	.	.	0.626	.	.
Dose3	5.08	0.498	5.08	0.361	.	.	.	.	.

SUMMARY	NOAEC	LOAEC
Dunnett	Dose3	>highest dose
Williams	Dose3	>highest dose

Bobwhite repro, metolachlor, MRID 465089-01
ANALYSIS RESULTS FOR VARIABLE WTGAINF (Female wt gain)

TESTS OF ASSUMPTIONS FOR PARAMETRIC ANALYSIS
Shapiro-Wilks test for Normality of Residuals -- alpha-level=0.01
Levenes test for homogeneity of variance(absolute residuals) -- alpha-level=0.05
Use parametric analyses if neither test rejected, otherwise non-parametric analyses.

Shapiro-Wilks Test Stat	Shapiro-Wilks P-value	Levenes Test Stat	Levenes P-value	Conclusion
0.901	<.001	1.885	0.142	USE NON-PARAMETRIC TESTS

****

BASIC SUMMARY STATISTICS

Level	N	Mean	StdDev	StdErr	Coef of Var	95% Conf. Interval
Ctrl	16	19.50	31.95	7.99	163.85	2.48, 36.52
Dose1	16	32.19	15.18	3.80	47.17	24.10, 40.28
Dose2	16	31.13	18.46	4.61	59.30	21.29, 40.96
Dose3	13	38.85	28.35	7.86	72.98	21.72, 55.98

Level	Median	Min	Max	%of Control(means)	%Reduction(means)
Ctrl	27.50	-66.00	54.00	.	.
Dose1	35.50	5.00	52.00	165.06	-65.06
Dose2	34.00	-11.00	57.00	159.62	-59.62
Dose3	44.00	-37.00	78.00	199.21	-99.21

****

NON-PARAMETRIC ANALYSES - use alpha-level=0.05 for all tests
Kruskal-Wallis test - equality among treatment groups

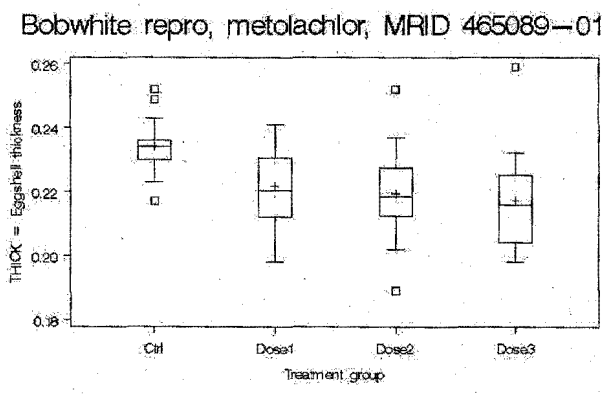
Degrees of Freedom	TestStat	P-value
3	3.53	0.316

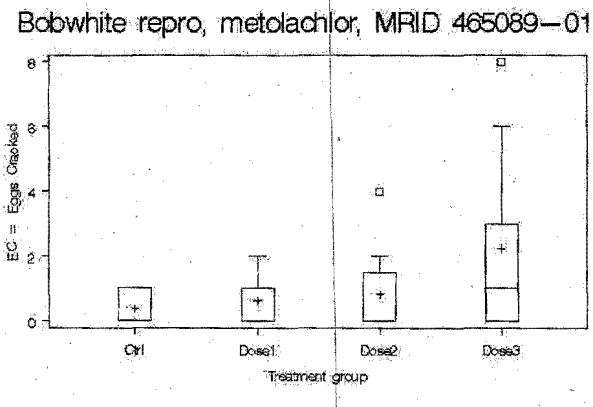
MannWhit(Bon) - testing each trt median signif. less than control
Jonckheere - test assumes dose-response relationship, testing negative trend

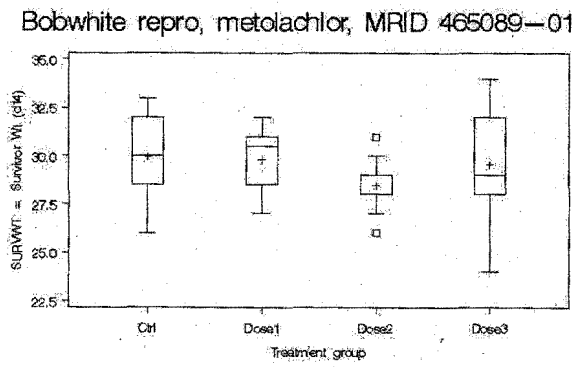
Level	Median	MannWhit(Bon adjust)p-value	Jonckheere p-value
Ctrl	27.50	.	.
Dose1	35.50	1.000	0.780
Dose2	34.00	1.000	0.725
Dose3	44.00	1.000	0.948

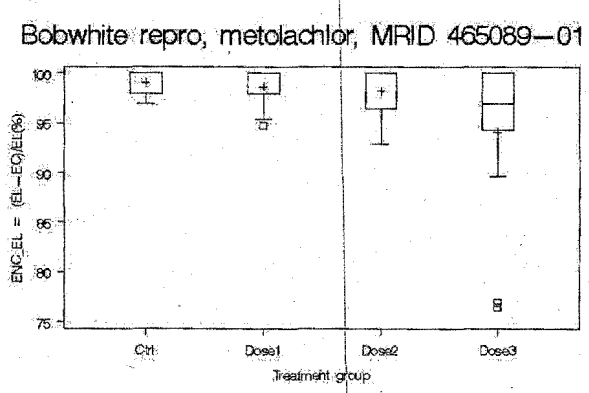
SUMMARY	NOAEC	LOAEC
MannWhit (Bonf adjust)	Dose3	>highest dose
Jonckheere	Dose3	>highest dose

Box Plots:


Bobwhite repro, metolachlor, MRID 465089–01
THICK = Eggshell thickness
0.26
0.24
0.22
0.20
0.18
Ctrl
Dose1
Dose2
Dose3
Treatment group


Bobwhite repro, metolachlor, MRID 465089–01
EC = Eggs Cracked
8
6
4
2
0
Ctrl
Dose1
Dose2
Dose3
Treatment group


Bobwhite repro, metolachlor, MRID 465089–01
SURVWT = Survivor Wt. (d14)
35.0
32.5
30.0
27.5
25.0
22.5
Ctrl
Dose1
Dose2
Dose3
Treatment group


Bobwhite repro, metolachlor, MRID 465089–01
ENC_EL = (EL–EC)/EL(%)
100
95
90
85
80
75
Ctrl
Dose1
Dose2
Dose3
Treatment group